the Irish land question. Experience has shown that the climate of a considerable portion of Ireland (especially in the coast districts) is not sufficiently favourable to produce crops which will permanently support the cultivator and yield large rents to the owners of the soil. In such cases the afforestation of surplus lands (that is to say, lands not required for agricultural operations) might prove a useful auxiliary in the solution of the Irish land question, by providing additional work which would enable the small cultivator to earn a day's wages whenever his presence was not required on his holding. Instead of sitting idle during a good portion of the winter, he could appreciably augment his income (and capacity to pay rent), without being obliged to leave his home in search of distant work

However, we must return to Dr. Brown. Our author has in the book under notice placed before the few who may be interested in the question, a fair account of how forest schools are arranged in Germany, the country where forest science has attained its highest development. The arrangement of studies at the several schools is given in considerable detail, and the book shows the high standard of education of German forest officers. Some of the schools are independent institutions situated in or near extensive forests, while others form part of Universities or technical Colleges. In the former case the education takes generally a more practical turn, while under the latter arrangement a higher standard of general education is likely to be secured. Dr. Brown is in favour of attaching the desired British forest school to a University or other similar educational establishment. In our opinion the decision on this point should depend on the class of men whom it is desired to educate. The ordinary foresters required by British landowners for the management of their woodlands are men who could not be enrolled as members of a University College; and their education must be of a more simple description, with a strong practical tendency. But men who are to join the general administration of India should attain a high standard of education, and a forest school for their benefit might well be attached to a University or to a high-class College. Unless such men are fit to take their proper place amongst the rest of the governing staff of the country, they will not be able to do justice to the work which will be intrusted to them on their arrival in India.

Both wants cannot be met by one set of men. The employment of men who have merely had a practical training might be disastrous to the Indian forests. On the other hand, British landowners would decline to receive men who, in consequence of a College education, would be above the ordinary work of a British forester, not to mention the fact that such men would expect higher rates of pay than the owners of woodlands would be willing to give them. In short, the course of studies to be followed by each of these two classes of men must be arranged on different lines. In either case, however, a tract of well-managed woodlands should be situated close to the seat of the school. To do without such a training-ground would be equivalent to training medical men without a hospital ready at hand. On this point we are decidedly at issue with Dr. Brown, who, in declaring such a school-forest unnecessary, has, in our opinion, only proved that he has failed to grasp the essential requirements of a forester's training. At the same time, the reader of Dr. Brown's books cannot help wondering at the marvellous industry employed by the venerable author in the compilation of his various works on Continental forest schools. Such energy and devotion are deserving of a better reward than they are likely to meet with, owing to the apathy on forest questions existing in this country. SW.

OBSERVATIONS AT GODTHAAB.

Observations Internationales Polaires, 1882–83. "Expédition Danoise: Observations faites a Godthaab sous la direction de Adam Paulsen." (Copenhague, 1886.)

THIS part of the publications of the Meteorological Institute of Denmark deals with the meteorological, tidal, and other observations made in 1882–83 by the Danish Arctic Expedition at Godthaab (64° 11′ N. lat.; 51° 44′ W. long.). The pages devoted to meteorology present us with detailed tabular views of the hourly observations of atmospheric pressure, temperature, and humidity, and the direction and velocity of the wind These are prefaced by an interesting and full discussion of the atmospheric pressure (illustrated with 186 pressure and wind charts of Greenland), which includes a valuable comparison of the observations of that year with those at all the stations since 1866.

In summer the mean lowest temperature, 38°·2, occurs at 2 a.m. and the highest, 43°·1, at 2 p.m., the daily range being thus 4°·9. On the other hand, the mean daily range of temperature is extremely small in winter, owing to the proximity of Godthaab to the Arctic circle. Thus the highest and lowest hourly temperatures were respectively in December, 19°·5 at 10 a.m. and 18°·0 at 10 p.m.; in January, 15°·1 at 5 p.m. and 14°·1 at 1 a.m.: and in February 4°·4 at 6 p.m. and 3°·7 at 3 p.m. Thus in February the mean warmest and coldest hour of the day show a difference of only 0°·7, and are only three hours apart from each other. Quite different is the amount of the daily range of temperature deduced from the maxima and minima of the month; in February the mean of all the highest was 9°·0 and of the lowest 0°·3, the difference being 8°·7. In these months the changes of temperature are but little influenced by the sun, being almost altogether occasioned by the passage of the cyclones and anticyclones. It is this practical elimination of the influence of the sun which gives a peculiar value to the temperature and hygrometric observations of such stations when any serious attempt is made to assign to these important elements the parts they play in the history of storms. The mean annual temperature calculated from the twenty-four hourly observations is only about one-tenth of a degree lower than that from the daily maxima and minima. In all the months the agreement is close, the greatest difference being 0°·5 in February and August; and in seven of the months the difference did not exceed 0°·1.

The results giving the variations in the hourly velocity of the wind are interesting as showing that such diurnal variation as may exist will require a number of years' observations to show it clearly, this periodicity being masked in an unusual degree by the high winds which accompany the low-pressure systems of Greenland.

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With eighteen years' observations (1866–83) at Ivigtut, Godthaab, and Jacobshavn, and nine years' (1875–83) at Upernivik, we can now present, with an approximate correctness not hitherto attainable, the distribution of pressure over Greenland during the months of the year. The following mean pressures, at 32° and sea-level, give the highest and lowest, with the months of their occurrence:—

	Highest. Inches.	Lowest. Inches.	Year. Inches.
Ivigtut	29·827 in May.	29·398 in January.	29·666
Godthaab ...	·847 ,,	·445 ,,	·684
Jacobshavn..	·898 ,,	·565 ,,	·749
Upernivik ...	·981 in April.	·603 ,,	·753

Thus in Greenland pressure increases with latitude. The difference between the extreme south and north is in January 0·205 inch, and in spring 0·154 inch; but the difference in summer is small, being in July only 0·008 inch. The above mean of January at Ivigtut 29·398 inches, and for the same month at Stykkisholm in the north-west of Iceland 29·396 inches, are, so far as known, the lowest mean monthly pressures anywhere yet observed in the northern hemisphere; and it is interesting to note that it is in the region immediately to the south and south-west of these places that a very large number of our European storms have their origin.

Attention is forcibly drawn by the 186 charts of pressure and wind to the remarkable fact that the depression areas of Greenland appear to travel from north to south. An extension of the area charted would doubtless show that while in many cases these areas travel northwards yet in a considerable number of cases this direction is more apparent than real. It is, however, abundantly evident that Greenland exerts an important influence on our Atlantic storms that remains still to be investigated.

The most elaborate part of the paper is the discussion of the diurnal curves of pressure from the hourly observations. The curve for the year exhibits the two usual maxima at 8 a.m. and 8 p.m., and the two minima at 2 a.m. and 1 p.m., the morning minimum and the evening maximum being respectively the greater, and these features of the curves are, with one exception, reproduced in the curves for the months. The results will be made to tell their story more clearly if we eliminate the more prominent irregularities attaching to means of one year only, by bloxaming the hourly means, by taking for the hourly means of each month means calculated from that month, the month immediately preceding, and that immediately following it. In these new mean hourly values the morning greatly exceeds the evening maximum in February, March, and April, whereas in every other month the reverse holds good, and that in a very pronounced degree. On the other hand, the morning greatly exceeds the afternoon minimum in each month of the year. From the relations the results show to those for places in similar situations in lower latitudes, we may conclude that unusual care has been taken in securing for the barometer a position where it was subject to only a very small daily change of temperature. It is absolutely necessary that this condition should be attended to, if observations are to be of any use at all in the discussion of the important question of the horary variations of pressure in high latitudes. Since the variations dealt with seldom exceed 0·010 inch, and are generally much less, it is evident that the inquiry is for these regions a refined one; hence it is essential that the attached thermometer should represent the temperature of the whole instrument to within 1° F. *It is the neglect of this point that vitiates* several series of horary barometric observations in the Arctic regions.

Over the open sea in high latitudes during the summer months, where the sun either does not set, or only for a brief interval, the diurnal curve of pressure differs essentially from the above. The observations made by the *Challenger* Expedition in the Antarctic Ocean, and those made by the Norwegian Expedition in the north of the Atlantic, show only one maximum and one minimum in the day, the maximum occurring during the day and the minimum during the night. This peculiar curve is restricted to the open sea of high latitudes. Director Paulsen is inclined to the opinion that the diurnal variation of pressure at Godthaab is caused not so much by local variations of temperature and humidity as by transmissions from lower latitudes of their diurnal variations of pressure. In this opinion we to some extent concur, it being probable that some of the more prominent features of these daily curves of pressure are the results of vast quasi-tidal movements communicated through the higher regions of the atmosphere, in which the space traversed by the individual aërial molecules is not necessarily great.

OUR BOOK SHELF.

Essays and Addresses. By the Rev. James M. Wilson, M.A. (London: Macmillan and Co., 1887.)

IN these "Essays and Addresses" Mr. Wilson deals chiefly with problems connected with religion and morality, and his main object seems to be to show that theological and ethical principles, properly interpreted, are supported, instead of being contradicted, by scientific ideas. The book is evidently the result of much independent reflection. Mr. Wilson tries to grapple with no intellectual difficulty which he has not thoroughly examined, and in all his statements of scientific doctrine he is scrupulously exact. He refers to science in so many aspects that much of what he has to say may be studied with interest even by readers who do not feel that his arguments with regard to such subjects as "Miracles" and "Christian Evidences" are perfectly conclusive.

Introductory Text-book of Physical Geography. By the late David Page, LL.D., F.G.S. Twelfth Edition. (Edinburgh and London: W. Blackwood and Sons, 1887.)

THIS book was originally published about twenty-five years ago, and has done good service in many schools and colleges. After the author's death it was brought up to date by Dr. Charles Lapworth, who, besides making a number of minor corrections and additions, contributed a summary of those results of the *Challenger* Expedition which had reference to the depths, deposits, and temperature of the ocean; an account of British storms; a description of the biological regions of the earth; and a short sketch of Prof. Huxley's arrangement of the human family. In the present edition Dr. Lapworth has again sought to bring the work abreast of scientific knowledge, introducing new matter relating to geology and petrography, meteorology and climatology, and the distribution of animals and plants. On the latter subject he has obtained from Prof. D'Arcy Thompson an excellent summary of recent biological research and theory. The

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